Grain and Feature Size Effect on Material Behavior for Micro-Sheet-Forming

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ABSTRACT

Negligible factors in bulk materials, such as grain-size effects, have proven inappropriate to be neglected for micro-forming processes. Studies had shown that material behavior varies greatly with the increasing of the scale in the micro-forming world. Therefore, in every micro-forming-related process, especially in micro-stamping, studies and analyses of each material used for the process have to be considered as indispensable in order to be able to understand their behavior and to be able to correlate their behavior with the process. Uniaxial tensile-testing experiments have been carried out to determine the strip's properties, behavior and its correlation with the feeding process in micro-stamping/micro-sheet-forming application. Based on the results of the uniaxial tensile-test experiments conducted, the flow stress was found to decrease with the decrease of the strip thickness and vice versa, due to the size/scale effect. A surface model was used to explain the findings.

KEYWORDS: Electron Backscatter Diffraction (EBSD), Grain-Size Effect, Micro-Sheet-Forming, Micro-Stamping, Strip Metal, Surface Model

DOI: 10.4028/www.scientific.net/AMM.680.77